THE EFFECTS OF PORT VISITS ON INFECTIVE AND PARASITIC DISEASES IN U.S. NAVY ENLISTED PERSONNEL

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Report No. 91-11

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BETHESDA, MARYLAND

The Effects of Port Visits on Infective and Parasitic Diseases in U.S. Navy Enlisted Personnel

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Approximately 19 percent of the enlisted crew from six ships in the Pacific fleet and 10 percent of the crew from six ships in the Atlantic fleet experienced at least one health problem as a result of infective and parasitic diseases during a six month deployment. Fungal, gonorrhea and the diarrheal illnesses accounted for the majority of these cases. Fungal infections known collectively as the dermatophytes accounted for the highest percentage of visits for both the ships from the Atlantic (59.5%) and Pacific (53.6%) fleets. Together, dermatophytosis and gonococcal infections accounted for approximately 80% of the infective and parasitic outpatient visits reported from the ships in the Pacific fleet, while dermatophytosis and diarrheal diseases accounted for 70% of those outpatient visits reported from the ships in the Atlantic fleet. One particular port in Southeast Asia appeared to be responsible for nearly all the gonorrhea and diarrheal cases that were reported from Pacific region. A number of ships from the Atlantic fleet reported a few cases of STD and diarrheal diseases after visiting ports in the Mediterranean, but no particular pattern or high risk port was apparent in contrast to the Pacific region.

Despite the many advances in the control and treatment of infectious and parasitic diseases and the trend toward fewer of these illnesses, they still account for a large part of the morbidity experienced by U.S. Navy personnel every year throughout the world (1,2,3). Approximately 1,400 hospitalizations occurred in Navy personnel last year as a result of these diseases, and it is estimated that the outpatient treatment for these same illnesses accounted for nearly five times that amount (4). Preventive measures to reduce the morbidity caused by these diseases are complicated by the lack of data on individuals treated as outpatients for these illnesses, particularly for those infections acquired while on deployment.

Personnel aboard Navy ships commonly visit ports in foreign countries, and the impact these port visits have on the health of the personnel aboard these ships is not clear. In a study of more than 10,000 Swiss who had traveled to developing countries for less than three months, 15 percent experienced health problems, and three percent were unable to work for an average of 15 days. Giardiasis, amebiasis, and gonorrhea accounted for the majority of these cases, and the most common modes of infection were enteral or sexual (5).

This report presents results from a six month surveillance program which monitored outpatient visits in enlisted Navy personnel for infectious and parasitic diseases occurring during or shortly after a port visit. The objective of this study was to collect epidemiologic baseline data on the incidence of these diseases in order to determine their impact on the health of the ships' crew, and to determine

what foreign ports are at high risk for these diseases.

MATERIALS AND METHODS

Although the Navy maintains an extensive computerized medical file for all Navy personnel treated as inpatients, an equivalent system for storing such data about outpatient visits does not currently exist (6). A new data collection form, referred to as the Patient Encounter Report, was developed at the Naval Health Research Center (NHRC) for this purpose (7). This form records important medical information on a per-visit basis. It records the reason for the visit by International Classification of Diseases, 9th Revision diagnostic categories (8), treatment(s) provided, and the disposition for each patient seen by the corpsman or physician aboard ship. It also records demographic data, such as age, paygrade, sex, occupation, and branch of service about each individual.

Medical information was collected from the crews of twelve U.S. Navy ships (six from the Pacific Fleet and six from the Atlantic Fleet) during their deployments in 1989. Another form provided data about the ports visits, time spent in each port, time in route, and the ships crew size. This form was completed and forwarded to the NHRC at the end of each month during the deployment. Twenty-one foreign port visits lasting three or more consecutive days were used in this analysis. Because the actual number of personnel going ashore at any one port was not recorded, illness rates could not be calculated. Instead, the data are presented as actual numbers of sick call visits.

The number of initial sick call visits for infective and parasitic diseases that occurred on each ship during the deployment period was plotted by week. Over ninety percent of these outpatient visits were classified into four disease categories: 1) Parasitic Diseases (consisting of pediculosis and acariasis), 2) Dermatophytosis, 3) diarrheal Diseases, and 4) Sexually Transmitted Diseases (STDs). STDs included infections due to syphilis and *Neisseria gonorrhoeae*, both penicillinase-producing *Neisseria gonorrhoeae* (PPNG) and non-PPNG. Comparisons of the types and frequencies of infective and parasitic diseases acquired during, or shortly after port visits, were made between Pacific and Atlantic based ships. In addition, a more detailed analysis of all reported cases of gonorrhea was undertaken to determine the prevalence of PPNG.

RESULTS

A total of 1,951 outpatient visits were reported for infective and parasitic diseases among the 12 ships during their six month deployments. The ships from the Pacific fleet reported 1,294 visits and those from the Atlantic fleet reported 657 visits. Figure 1 shows number of visits by type of illness for Pacific versus Atlantic based ships. Fungal infections, known collectively as the dermatophytes, accounted for the highest percentage of visits for both the ships from the Atlantic (59.5%) and Pacific (53.6%) fleets. Together, dermatophytosis and gonococcal infections accounted for approximately 80% of the infective and parasitic outpatient visits reported from the ships in the Pacific fleet, while dermatophytosis and diarrheal diseases accounted for 70% of those outpatient visits reported from the ships in the Atlantic fleet.

Several distinct "outbreaks" of disease that were observed on all six ships from the Pacific fleet

during their port visits are shown in figure 2. The horizontal bar under each histogram denotes when the ships were in port (black) and when they were at sea (white) during their deployments. Each histogram shows two or three distinct peaks in the number of cases of infectious and parasitic diseases reported during this 24 week period. In each case, the highest peak seems to be associated with the first port visit. These peaks are due primarily to gonococcal infections, and to a lesser extent the diarrheal diseases. The incubation period for *Neisseria gonorrhoeae* is usually two to seven days, and the incubation period for diarrheal diseases is usually 12 to 72 hours depending on the particular etiological agent (9). The rapid rise and fall of these "epidemic" curves is compatible with a point-source exposure occurring over a brief period of time, such as a three or four day port visit. One stopover in Southeast Asia (WP1) is of particular interest because it appears to be responsible for the majority of outpatient visits for both the diarrheal and STDs. All six of the ships from the Pacific fleet spent time at this port and showed a distinct increase in the number of cases reported for both of these diseases. However, during subsequent visits to this port by the same ships fewer cases of STDs were reported, possibly indicating that those individuals who became infected the first time began taking necessary precautions.

The disease profile for the ships from the Atlantic fleet is considerably different than that of the ships from the Pacific fleet as shown in figure 3. The most obvious difference is the lack of distinct peaks in the number of outpatient visits for infective and parasitic diseases following a port visit. The Atlantic fleet ships reported significantly fewer cases of gonococcal infections, and many more cases of Fungal infection. Fungal infections can be transmitted either by direct or indirect contact, and most have variable incubation periods (9). There are many potential sources of dermatophyte infections, such as combs, towels, blankets, and barber shears (10). These fomites can serve to spread the fungus from the primary source to other contacts, often resulting in a propagated "epidemic" curve which appears to be occurring on the Aircraft carrier (Graph AF in figure 3). This particular ship, because of its size accounted for nearly 70% of all outpatient visits for infective and parasitic diseases reported from the six Atlantic ships. The other five ships reported a few cases of STDs and diarrheal diseases after visiting ports in the Mediterranean, but no particular pattern or high risk port was apparent in contrast to the ports visited by the ships from the Pacific fleet.

Figure 4 shows the number of first visits for gonorrhea (both PPNG and Non-PPNG) reported in ships from the Pacific fleet. There were a total of 256 initial visits for gonorrhea, and forty-three percent of these were diagnosed as PPNG. The majority of all these cases occurred during or shortly after visiting port WP1 in Southeast Asia, indicating that PPNG is hyperendemic. Rothenberg and Voigt have shown that once the incidence of PPNG infection in a community has reached 20 cases per month, eradication becomes highly unlikely. This observation was part of the basis for defining areas as having endemic or hyperendemic PPNG (11). As a control measure, the Centers for Disease Control (CDC) recommended in 1987 that ceftriaxone be used to treat all gonococcal infections where local PPNG prevalence was greater than 1%. So far, no organisms resistant to ceftriaxone or other third-generation cephalosporins have been found (12).

DISCUSSION

Approximately 19 percent of the enlisted crew from the ships in the Pacific fleet and 10 percent of the crew from the ships in the Atlantic fleet experienced at least one health problem as a result of infective and parasitic diseases during the six month deployment. Fungal, gonorrhea and the diarrheal illnesses accounted for the majority of these cases, and a number of ports were determined to be at high risk for these diseases. The large number of reported cases of dermatophytosis for both the Atlantic and Pacific ships is not unusual. These are superficial Fungal infections of keratinized tissues, and include *tinea capitis*, *tinea corporis*, *tinea curuis*, *tinea pedis*, and *tinea unguium* (9). They are quite common throughout the world, and occur most frequently in areas with a warm moist environment and where personal hygiene is compromised. However, they are seldom severe, and rarely become systemic. A number of ships from the Atlantic fleet reported an increase in the number of diarrheal cases occurring during or shortly after visiting a few of the Mediterranean ports, but in contrast to the ships in the Pacific fleet, there was no single port that was responsible for the majority of cases for any one illness.

There are a number of ports at high risk in the Pacific region for STDs and diarrheal diseases. One particular port in Southeast Asia (WP1) appeared to be responsible for nearly all cases of gonorrhea and diarrheal disease that were reported from the six ships in the Pacific fleet. The distribution of STDs is particularly important because with each reported case of a STD there exists the potential to become infected with the Human Immunodeficiency Virus (HIV). Acquired Immune Deficiency Syndrome (AIDS) is one of a number of STDs of increasing importance to health care providers, primarily because it is expanding beyond the initial high-risk groups to heterosexual contacts and has a high case fatality rate (13). Other STDs of concern include chlamydia, herpes virus and gonorrhea, especially those cases of gonorrhea caused by penicillinase-producing *Neisseria gonorrhoeae* (PPNG). Forty three percent of the gonorrhea infections reported by the ships from the Western fleet were due to PPNG. Infections caused by PPNG have in the past been treated successfully with the antibiotic spectinomycin, but beginning in 1981 spectinomycin-resistant PPNG began appearing in Southeast Asia (14). Military personnel on deployment in Southeast Asia may encounter these new resistant strains of gonorrhea, and if not treated effectively may introduce them into new areas. It could not be determined from available data if any cases of spectinomycin-resistant PPNG were encountered during this study. However, the choice of therapy for *Neisseria gonorrhoeae* infections is now complicated by these multiple antibiotic resistance strains, and military health care providers need to be on the alert for spectinomycin-resistant PPNG.

An earlier paper describing the social aspects of STDs aboard a Navy destroyer on a seven month deployment, reported that nearly half of the crew (48%) experienced at least one case of a STD, and of these patients, 38% had repeat infections (15). In the present study, the percentage of the enlisted crew from ships in the Pacific fleet experiencing at least one STDs ranged from 1.7% to 11.5%. This is considerably lower than previously reported, and probably reflects a higher awareness of the consequences of having

unsafe sex. However, with recent increases in the rise of drug-resistant strains of some sexually transmitted bacterial infections along with the rapid spread of AIDS, the need for prevention becomes even more important. Because the STDs accounted for a large number of the outpatient visits reported in this study, emphasis needs to be placed on safe sex practices prior to visiting any port which poses a high risk for STDs.

The information on the distribution of infectious and parasitic diseases reported in this study demonstrates the value of monitoring outpatient visits. Surveillance of outpatient data would provide the needed information to effectively reduce the morbidity and lost manhours due to these and other illnesses. A monitoring program would be instrumental in providing the knowledge needed to implement effective control and prevention measures, and may allow for the early detection of new antibiotic resistant organisms.

ACKNOWLEDGMENT

Report No. 91-11 was supported by the Naval Medical Research and Development Command, Bethesda, MD, Department of the Navy, under Work Unit No. M0095.005-6050. The views expressed in this article are those of the authors and do not reflect the official policy or position of the Department of Navy, Department of Defense, nor the U.S. Government.

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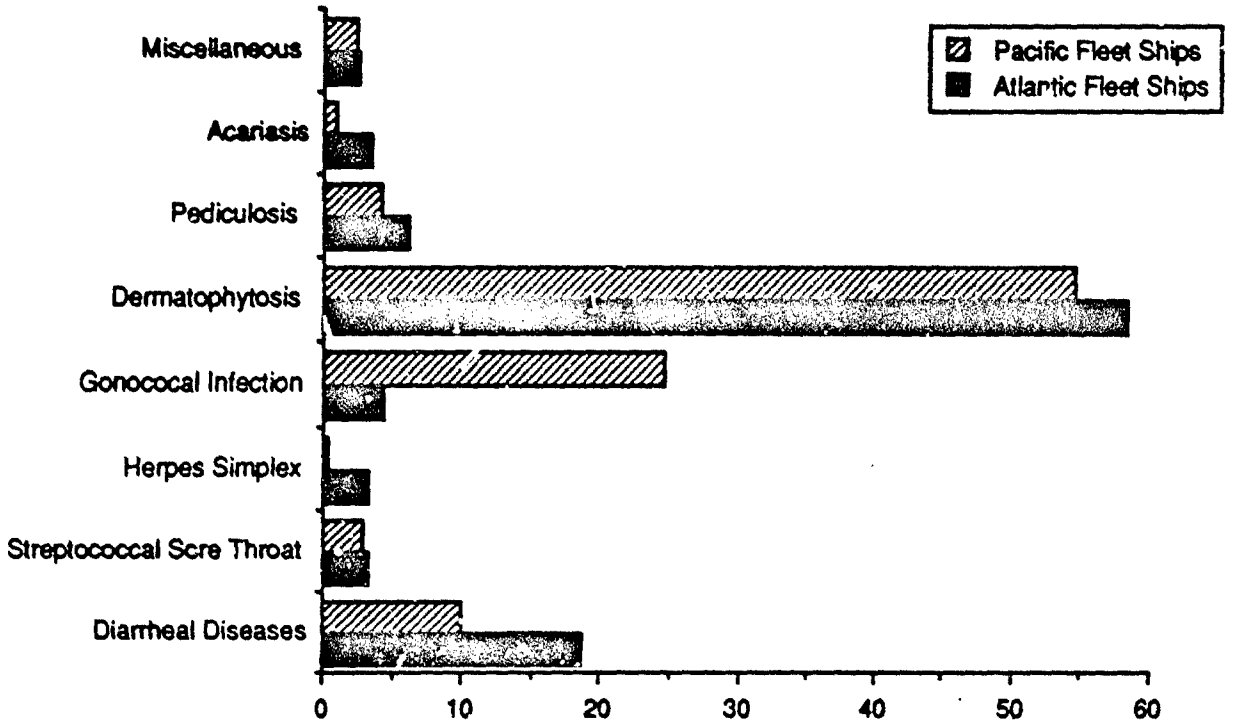

Figure 1. Percentage of outpatient first visits for infectious and parasitic diseases occurring aboard 12 US Navy ships from the Pacific and Atlantic Fleet

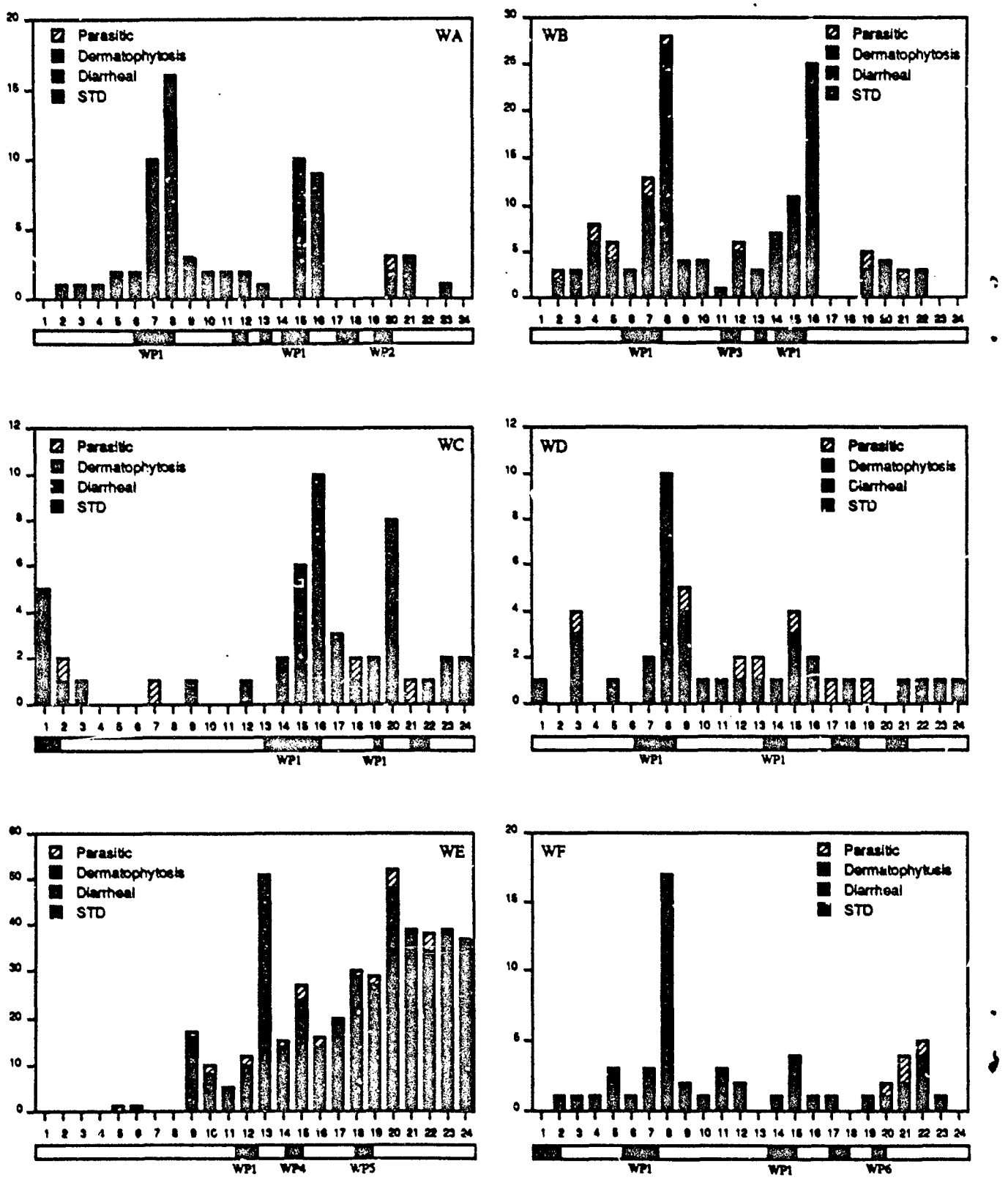

Figure 2. Number of outpatient first visits for Infective and Parasitic diseases occurring aboard six US Navy ships (■ = time spent in port) deployed in the Western Pacific during a 24 week period January - June 1989

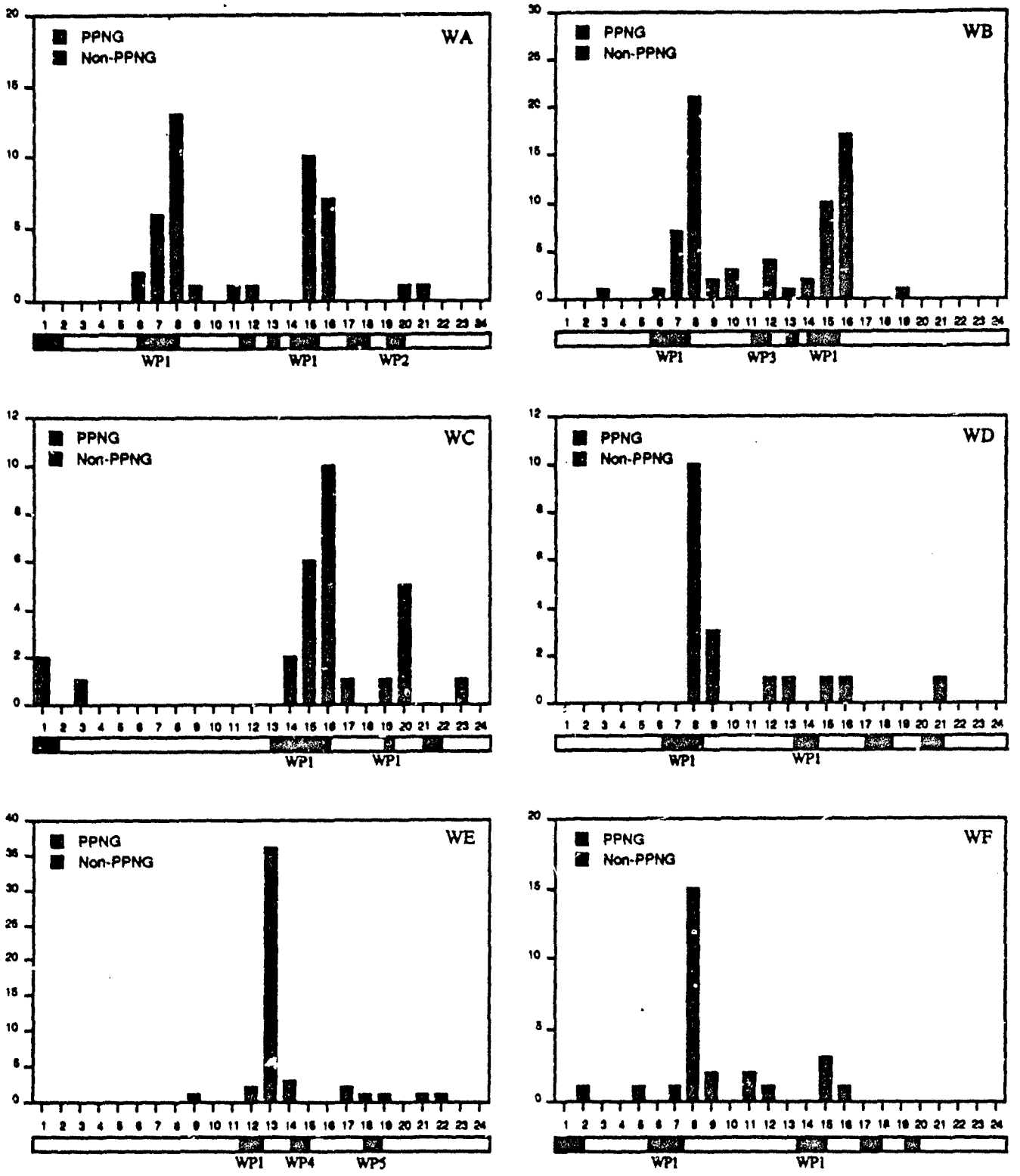

Figure 4. Number of outpatient first visits for infections caused by PPNG and Non-PPNG occurring aboard six US Navy ships (■ = time spent in port) deployed in the Western Pacific during a 24 week period, January - June 1989

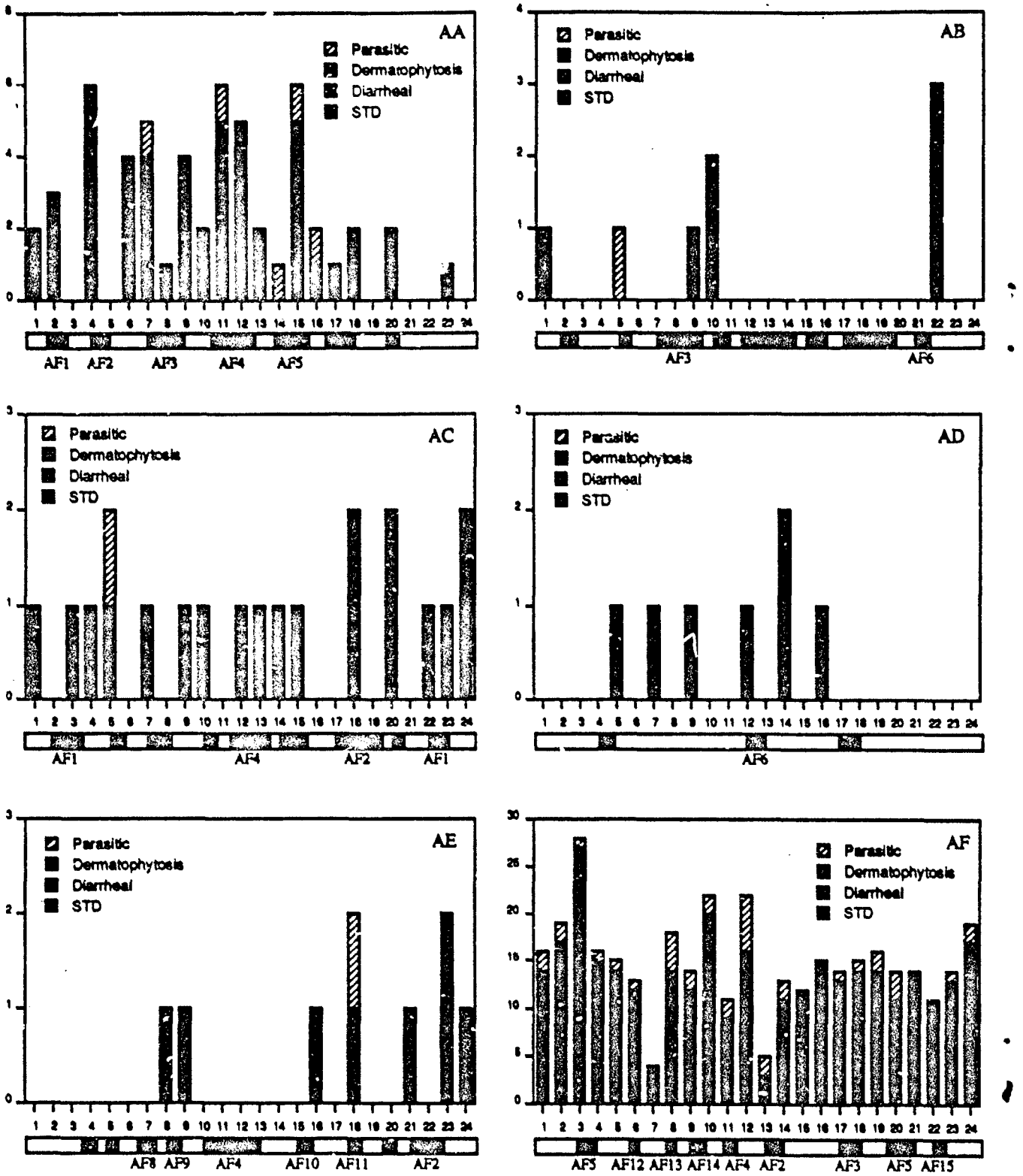

Figure 3. Number of outpatient first visits for Infective and Parasitic diseases occurring aboard six US Navy ships (■ = time spent in port) deployed in the Atlantic during a 24 week period January - June 1989

REPORT DOCUMENTATION PAGE

Form Approved
OMB No. 0704-0188

1. AGENCY USE ONLY *(Leave blank)*	2. REPORT DATE	3. REPORT TYPE AND DATE COVERED
	JUN 91	FINAL

4. TITLE AND SUBTITLE
(U) THE EFFECTS OF PORT VISITS ON INFECTIVE AND PARASITIC DISEASES IN U.S. NAVY ENLISTED PERSONNEL

5. FUNDING NUMBERS
Program Element: 63706N
Work Unit Number: 6004

6. AUTHOR(S)
WHITE, MARTIN R.; HERMANSEN, LARRY A.; SHAW, EDDIE

7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES)
Naval Health Research Center
P. O. Box 85122
San Diego, CA 92186-5122

8. PERFORMING ORGANIZATION
Report No. 91-11

9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES)
Naval Medical Research and Development Command
National Naval Medical Center
Building 1, Tower 2
Bethesda, MD 20889-5044

10. SPONSORING/MONITORING AGENCY REPORT NUMBER
91-11

11. SUPPLEMENTARY NOTES N/A

12a. DISTRIBUTION/AVAILABILITY STATEMENT
Approved for public release; distribution is unlimited.

12b. DISTRIBUTION CODE

13. ABSTRACT *(Maximum 200 words)*

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14. SUBJECT TERMS	15. NUMBER OF PAGES
INFECTIOUS DISEASES, PARASITIC DISEASES, AND EPIDEMIOLOGY	16. PRICE CODE

17. SECURITY CLASSIFICATION OF REPORT	18. SECURITY CLASSIFICATION OF THIS PAGE	19. SECURITY CLASSIFICATION OF ABSTRACT	20. LIMITATION OF ABSTRACT
Unclassified	Unclassified	Unclassified	Unlimited